

# Renewable Energy Sources in Vermont: A Status Report

May, 2010



By: Guy Page  
Vermont Energy Partnership

 **VermontEnergyPartnership**  
*Working for Reliable Affordable Clean Energy for Vermont*

# Renewable Energy Sources in Vermont: A Status Report

## Introduction

Renewable energy sources are widely discussed in the media and among state and federal lawmakers today as a possible solution to reducing carbon dioxide and other emissions from electricity production, as well as increasing our energy independence.

While subsidies at both the federal and state levels have been adopted to promote the development, expansion and use of renewable energy sources, today the energy sources defined as renewable under the American Clean Energy and Security Act of 2009 (ACES)<sup>1</sup> provide only a tiny fraction of the energy that Vermont and the nation depend on to power our homes, businesses, schools, hospitals, etc.

Based on research conducted by the Vermont Energy Partnership (VTEP), the following issue brief has been developed to provide an overview of Vermont's renewable energy supply, including sources currently operating and in the development and planning stages. As comprehensive documentation, data and pricing for these energy sources are not readily available, readers should note that VTEP does not claim that this issue brief includes every renewable energy source in Vermont or neighboring states. This is a working document that will continue to be updated.

## Vermont's Electricity Portfolio

Currently, Vermont produces approximately half of the electricity it uses in state and imports the other half from Canada and other New England states. According to the U.S. Energy Information Administration (EIA), Vermont Yankee's nuclear power accounts for about three-fourths of the electricity generated within Vermont.<sup>2</sup> The EIA adds, "Most of Vermont's remaining generation is produced from renewable energy sources, largely from hydroelectric power and fuel wood. Vermont's numerous small-scale hydroelectric power projects typically account for about one-fifth of State electricity production." Non-hydroelectric renewable energy sources, including wood, wood waste, and wind, account for between 5 and 10 percent of state electricity production.

In total, Vermont needs an estimated 700 Megawatts (MW) of electricity to meet current demand. Peak demand is about 1,000 MW.<sup>3</sup> One Megawatt is enough to power up to about 1,000 average Vermont homes.

---

<sup>1</sup> Open Congress: Sources defined as renewable under ACES include wind, solar and geothermal energy, renewable biogas and biofuels derived exclusively from biomass, qualified hydropower, marine and hydrokinetic renewable energy, landfill gas and other methane and qualified waste-to-energy. <http://www.opencongress.org/bill/111-h2454/show>

<sup>2</sup> U.S. Energy Information Administration, State Energy Profiles, Vermont  
[http://tonto.eia.doe.gov/state/state\\_energy\\_profiles.cfm?sid=VT](http://tonto.eia.doe.gov/state/state_energy_profiles.cfm?sid=VT)

<sup>3</sup> ISO-New England: Vermont 2010 State Profile: [http://isonewengland.org/nwsiss/grid\\_mkts/key\\_facts/vt\\_01-010\\_profile.pdf](http://isonewengland.org/nwsiss/grid_mkts/key_facts/vt_01-010_profile.pdf)

## **Overview of Vermont Renewable Energy Sources**

According to the EIA, sources defined as renewable under the ACES (which do not include large hydropower dam facilities like Hydro-Québec) met approximately 8 percent of Vermont's energy supply in 2007. Despite the addition of some small-scale renewable power generators, this percentage has not changed significantly since then. The following sections discuss the different forms of renewable energy currently in use or planned in Vermont today. Additionally, certain out-of-state renewable sources, energy efficiency and conservation, and the Feed-In Tariff (FIT) adopted by the Vermont legislature in 2009 are also discussed.

For comparison, Vermont's two large baseload sources of electricity, Hydro-Québec and Vermont Yankee, provide 220 and 270 MW to the state, respectively.

### **Wind Power**

At present, one wind turbine farm is currently operating in Vermont: Green Mountain Power's 6 MW prototype "Searsburg 1." Note that all MW figures are for total capacity only; actual output of wind is estimated at about one-third of total capacity.<sup>4</sup> The following three proposed wind farms are in the final stages of the permitting process, and are considered good candidates for construction and operation barring unforeseen developments.

- Deerfield Wind, a 30-45 MW expansion to the Searsburg wind facility, has received a draft Environmental Impact Statement from the U.S. Forest Service, a notable milestone, but is still awaiting permits.
- Green Mountain Power's Kingdom Community Wind (up to 63 MW estimated output) must still undergo the Act 248 permit process but received voter approval at the 2010 Lowell Town Meeting.
- Sheffield Wind (40 MW) is a Northeast Kingdom project owned by First Wind of Boston. The Sheffield project has received a certificate of public good (CPG) from the Vermont Department of Public Service and has local municipal approval, but a state water runoff permit is pending.

Two other projects face significant permitting challenges:

- Georgia Wind (12 MW), a family-owned project in southern Franklin County has a CPG in process.
- East Haven (6 MW) is a Northeast Kingdom project currently being evaluated by the Vermont Public Power Supply Authority (VPPSA), a collection of municipal utilities.

---

<sup>4</sup> Note: For the purposes of this study, the total capacity of the energy source is employed. Unlike many baseload power plants which generate electricity at near 100 percent capacity, 365 days a year except for unplanned and scheduled outages, wind and solar are intermittent energy sources and operate at lower percentages of total capacity. According to [the American Wind Energy Association](#), 25-40 percent efficiency is common, and an average of 33 percent is employed in this document. Methane and biomass achieve an estimated 85 percent of capacity.

Vermont media sources and Vermont Department of Public Service dockets show six proposed wind farms making little or no progress at present: Manchester Community Wind (24 MW, Bennington County); Glebe Mountain Wind, (2.2 MW, Windham County); Windham (52 MW, Windham County); Grandpa's Knob in Rutland County (85 MW), recently purchased by Reunion Power of New York State from Noble Environmental, no CPG application; Dutch Hill (45 MW, Windham County); and Vermont Community Wind (27 MW, Rutland County). The developers of the latter project announced in April 2010 that this project is on hold, a decision following a March 2010 Town Meeting referendum interpreted as a vote of no confidence for the project.

***In total, operational wind capacity in Vermont is 6 MW, and maximum estimated additional wind capacity in the next several years is 148 MW from the Kingdom Community, Sheffield and Deerfield projects. Actual generation, using the 33 percent assumption, would be 49 MW.***

### **Solar Power**

At present, there are no large, commercial solar generators providing power directly into Vermont's electric grid. Central Vermont Public Service's 50 KW Solar Array contributes power directly into the grid. Green Mountain Power hopes to have completed a 200 KW array in Berlin by the end of the summer. At least two businesses (Green Mountain Coffee and National Life) have installed solar arrays of more than 100 KW that are "net metered," with the power they produce being sold into the system and its value deducted from the company's power bill. "Net metering" is the preferred system for most residential solar systems, as well. There are also several applications, but nothing in construction yet, for projects through the Feed-In Tariff of 2.2 MW or less (see section below).

### **Methane**

Methane electrical generators burn methane gas collected from landfills and cow manure. At present 12 known sites generate electricity (10 farms, two landfills).

The two landfills, Coventry in Orleans County and Moretown in Washington County, at peak capacity produce about 11 MW combined. Output is likely to increase as more municipal waste is introduced, and as more planned generation capacity is added. The Burlington landfill also produces about 0.3 MW for Burlington Electric Department. On the downside, the supply of organic-based trash is not unlimited, especially as Vermonters compost more and throw away less.

Central Vermont Public Service, the state's largest utility, has created the Cow Power program that promotes methane generators on six large Vermont dairy farms. The largest of these generators, Pleasant Valley Farm in Berkshire, produces about 0.5 MW. The combined capacity of the six CVPS "Cow Power" farms is about 1.5 MW. CVPS plans to add more farms to this program, with two in construction this year and several others in the permitting stage.

In Westminster (Windham County), a farm-based manure digester supported by Green Mountain Power produces about 0.2 MW.

***In total, operational methane capacity in Vermont is approximately 12 MW; estimated additional capacity in the near-future is 3 MW.***

## **Biomass**

Currently, two power plants burn wood and wood waste to generate electricity. The East Ryegate power station in Caledonia County generates 20 MW. However, state energy officials say the Ryegate contract may not be renewed after it expires in 2012. In Burlington, Burlington Electric Department's McNeil Generating Station burns wood chips at 50 MW.

Three other biomass electrical generating plants have been proposed: New England Alternative Energy in Fair Haven, 30 MW; Winstanley Energy in Springfield, 25 MW; and a plant of similar output on the site of the former Pownal dog racing track. All three projects are in the exploratory, pre-permit stages. Due to reported financing issues, the Winstanley plant project has stalled since November 2008.

In Vermont, biomass efforts tend to focus on direct thermal generation for schools and building complexes, and several smaller scale biomass power generators, including Brattleboro Kiln Dry (.38 MW), Pampanoosuc Mills (.05 MW), Bell Gates Lumber (.075 MW), and the North Country Hospital (.265 MW). Green Mountain College is installing a biomass boiler that will produce net-metered electricity. Middlebury College has installed a biomass boiler that is combined with its steam turbine electrical generators and provides net metered power.

***In total, operational biomass capacity is approximately 70 MW (assuming Ryegate contract is renewed after 2012); estimated additional capacity in the near-future: 0.***

## **Energy Efficiency and Conservation**

Energy efficiency has its own Vermont "utility", Efficiency Vermont, and is an important component in the Vermont electricity portfolio. Also known as "demand side management," efficiency and conservation efforts are credited with reducing consumption increases from 27 percent to 9 percent during the 1992 – 2007 time period.<sup>5</sup>

---

<sup>5</sup> Vermont Department of Public Service: Utility Facts, 2008. Pg. 6, Fig. 1.6.  
[http://www.google.com/url?sa=t&source=web&ct=res&cd=2&ved=0CAwQFjAB&url=http%3A%2F%2Fpublicservice.vermont.gov%2Fpub%2Fother%2Futilityfactsfinaldraft2008.doc&ei=6cnES\\_nwB8L78Aay6bCtDw&usg=AFQjCNHuUlhTKgmiH\\_c3RZxIIEdX46Wcw](http://www.google.com/url?sa=t&source=web&ct=res&cd=2&ved=0CAwQFjAB&url=http%3A%2F%2Fpublicservice.vermont.gov%2Fpub%2Fother%2Futilityfactsfinaldraft2008.doc&ei=6cnES_nwB8L78Aay6bCtDw&usg=AFQjCNHuUlhTKgmiH_c3RZxIIEdX46Wcw)

For the purposes of this study, net metering is regarded as an efficiency measure, and not as commercial power generation. At present these hundreds of small-scale business and residential renewable power generators produce about 5 MW, less than one percent of Vermont's average load. With assistance from state and federal educational and financing programs, net metered renewable power has been a growth area in recent years. However, it should be noted that the loss of even a small baseload power generator such as the 20 MW Ryegate biomass plant would create a power deficit of four times the 5 MW contribution of net-metered power.

Based on this data, the state's energy efficiency efforts have reduced, but not stopped or reversed, the rate of growth in electricity consumption. In 2008, electricity consumption decreased slightly from 2007, the first time since 1992 an actual year to year reduction has happened. State energy officials say the state's power load is likely to remain virtually flat, due mostly to slow economic growth.

### **Out-of-State Renewable Energy Sources**

Currently, there are no known or proposed direct contracts for out-of-state solar, biomass, or methane generation.

For wind, there is a component included in the state's contract with Hydro-Québec. In addition, wind power may also come from two out-of-state sources: the Granite Reliable wind farm in Coos County, New Hampshire, and various upstate New York wind farms.

The Granite Reliable Wind project may provide 55 MW of capacity to Vermont utilities, according to an agreement made in February 2010 with owner Noble Environmental of Connecticut. Granite Reliable is currently in the permit process with the State of New Hampshire.

Delivering upstate New York wind power to Vermont faces transmission challenges due to lack of capacity. As a possible remedy, a \$3.8 billion, 2,000 MW cable has been proposed to run under Lake Champlain. Planning is in the initial stages, and construction would require four years. Even if the cable is built, regional demand for renewable power makes Vermont access uncertain.

***Currently, there are no operational out-of-state solar, wind, biomass or methane sources being sold directly to Vermont utilities. However, 55 MW of wind capacity is estimated to come online in the next several years.***

## **Feed-In Tariff Program**

In 2009, the Vermont Legislature created the Feed-In Tariff (FIT) program which guarantees a subsidized price for solar, wind and methane projects of 2.2 MW or less. The total capacity is capped at 50 MW. Assuming a full build-out of the 50 MW and optimum efficiency of a mix of wind, solar and methane projects, it is reasonable to project 25 MW of output from FIT-supported projects in the near future.

## **Possible Obstacles to Instate Renewable Power Development**

Two factors may impede instate renewable development: price and interconnection challenges. Apart from the Feed-In-Tariff program, energy purchasing is generally market based; at present solar, wind, methane and biomass are all more costly than Hydro-Québec or Vermont Yankee; about 50 percent more costly for landfill methane, 500 percent more costly for Feed-In Tariff solar, with wind, wood and “cow-power” methane falling somewhere in between. Prices are subject to change by market pressures and the presence of power contracts. The extent to which the transmission and distribution system may need to be expanded and/or upgraded will depend on the type, quantity and generator location of the renewable power source.

## **Conclusion**

While renewable energy sources can and should be aggressively pursued to meet Vermont’s energy supply, there is not enough proposed, viable renewable power to meet a significant part of our current electricity demand with renewables. Likewise, energy efficiency and conservation initiatives can help reduce power consumption, especially during peak periods of demand, but at current levels of engagement cannot significantly reduce overall consumption.

Based on the report’s findings, known operational renewable power in Vermont today totals approximately 84 MW of output; rough estimates, based on the inclusion of several pending projects, project an additional 95<sup>6</sup> MW of output may be online within the next five years.

As stated above, and as shown in the table below, Vermont requires an average of 700 MW of electricity, 1000 MW at peak. Combined Vermont Yankee and Hydro-Québec provide 490 MW. Instate hydro – which is not expected to add significant capacity in the near future – provides about 80 MW. Current renewables provide 84 MW. With the addition of 95 MW of foreseeable renewable power, Vermont will have a 727 MW mix of mostly baseload power. It should be noted that even if 95 MW of renewable capacity is achieved in five years and energy efficiency and conservation initiatives progress significantly, Vermont would still face a significant deficit if Vermont loses the power from either Hydro-Québec or Vermont Yankee and no comparable baseload power is acquired. In the absence of instate

---

<sup>6</sup> Determination of estimate of 95 MW output of new renewable energy: 148 MW wind capacity x .33 = 49 MW output; 3 MW methane capacity x .85 = 3; Granite Wind, 55 x .33 = 18; FIT, all sources, 25 MW; 49 + 3 + 18 + 25 = 95.

alternatives, Vermont’s reliance on ISO – New England power, with its high-carbon output and fluctuating prices, would rise considerably.

### **Vermont’s Electricity Supply and Usage**

	<u>Megawatts</u>
Vermont’s Electricity Needs (average-peak usage, 2010)	700-1,000
 <u>Maximum from Instate Sources</u>	
Vermont Yankee	270
Instate Hydro	80
Other instate renewables	84
Subtotal:	434
Supply Deficit:	266-566
 <u>Maximum from Instate Sources and Hydro-Québec</u>	
Hydro-Québec	220
Subtotal	654
Supply Deficit	46-346
 <u>Future Vermont Renewable Generation</u>	
(next five years, approx.)	95
Supply Surplus/Deficit	+49/-241

VTEP strongly supports the aggressive development of instate renewable power to help meet the state’s energy demand with new sources of clean, safe, affordable and dependable electricity. To address the energy deficit described above, VTEP supports a foundation of clean, dependable and competitively priced electricity from a renewed contract with Hydro-Québec and the relicensing of the Vermont Yankee nuclear power plant.

*The Vermont Energy Partnership ([www.vtep.org](http://www.vtep.org)) is a diverse group of business, labor, and community leaders committed to finding clean, low-cost and reliable electricity solutions to ensure Vermont stays a great place to live and work.*